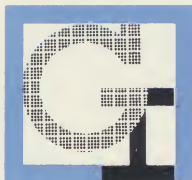


GENERAL INSTRUMENT CORPORATION

MAGNETOSTRICTIVE DELAY LINES

PRODUCT DATA SHEETS

# GENERAL INSTRUMENT CORPORATION



DEFENSE AND ENGINEERING PRODUCTS GROUP

GENERAL INSTRUMENT CORPORATION

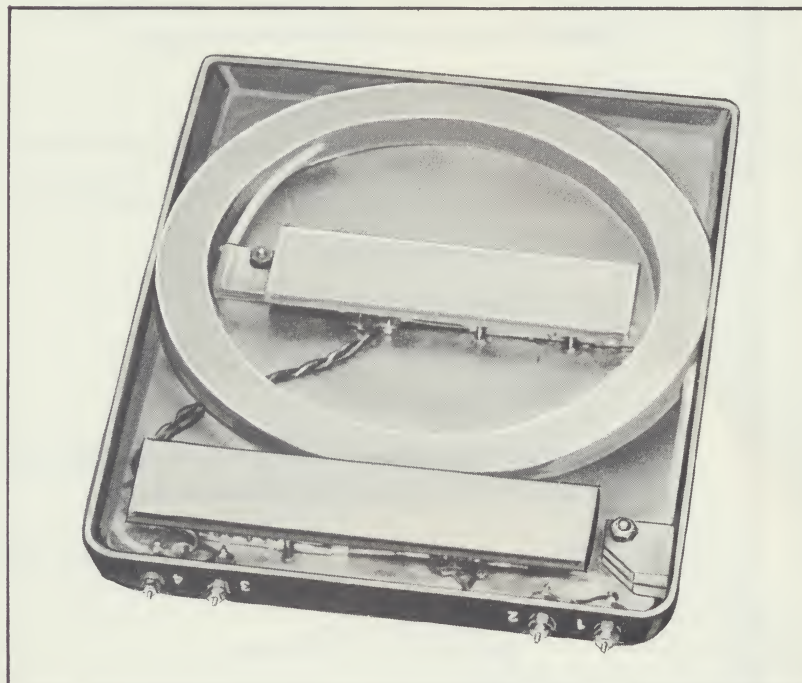
RADIO RECEPTOR DIVISION  
100 Andrews Road  
Hicksville, Long Island, N. Y.

MAGNETOSTRICTIVE DELAY LINES

- ECONOMICAL ..... Magnetostrictive delay lines are lower in initial cost and require less auxiliary circuitry. Lower power consumption.
- FAST ..... Bit rates in excess of 2 megacycles are readily accommodated with conventional magnetostrictive delay lines. Access times depend on storage capacity.
- FLEXIBLE ..... Delay line manufacturing techniques offer users a continuous range of bit capacities from 1 bit to tens of thousands in a single unit. Operation can be synchronized with system clocks.
- DEPENDABLE ..... Absence of wearing parts gives delay lines unlimited life without maintenance. They are ready for use instantaneously without warmup or startup time.
- ADAPTABLE ..... Delay lines can be adapted to a wide variety of digital and analog applications over a wide range of environmental conditions. Modern packaging techniques provide compactness with extreme form factor flexibility.
- EXPANDABLE ..... Memory systems are readily expanded by adding more delay line elements. A number of lines may be operated in parallel, or "corner turners" applied where word parallel operation is desired.
- AVAILABLE ..... Fast deliveries, with or without electronics, can be offered and fulfilled. Even special prototypes can be produced quickly and economically. Production costs are extremely low for quantity orders.



## **HIGH FREQUENCY MAGNETOSTRICTIVE DELAY LINES**



### **HTDL Series Torsional Mode**

**DELAY RANGE:**  
60 to 1500 microseconds

Unique high frequency magnetostrictive delay lines, capable of "storing" twice the amount of digital information handled by any comparable devices of their type, are now available for aerospace and other critical military and commercial applications.

- 
- Operating frequencies to 4.0 mc in the NRZ mode
  - Digital serial memory to 6,000 bits
- 

The cost of the HTDL is as much as 75% less than a comparable quartz or glass unit.

DATA SHEET DL404-64

DIVISIONS AND SUBSIDIARIES OF GENERAL INSTRUMENT CORPORATION INCLUDE: RADIO RECEPTOR COMPANY, INC. / HARRIS ASW DIVISION / F. W. SICKLES DIVISION  
ADVANCED DEVELOPMENT LABORATORY, EAST AND WEST COAST DIVISIONS / AUTOMATIC MANUFACTURING DIVISION / THERMOELECTRIC DIVISION / MAGNEHEAD  
DIVISION / SYSTEMATICS DIVISION / G.I.—F. W. SICKLES OF CANADA, LTD. / APPLIED RESEARCH LABORATORY / SEMICONDUCTOR DIVISION / CAPACITOR DIVISION

## **SPECIFICATIONS (General)**

- **Delay Range:** Nominal 60 to 1500 microseconds
- **Adjustment:** To 4 microseconds
- **Encapsulated**
- **Tolerance On Nominal Delay:**  $\pm 50$  nanoseconds
- **Temperature Range:**  $-25^{\circ}$  to  $+100^{\circ}\text{C}$
- **Temperature Coefficient of Delay:** Less than 1 part /million/ $^{\circ}\text{C}$ .
- **Insertion Loss:** 50 to 60 db—with Read-Write Amplifiers 1:1
- **Signal to Noise Ratio:** Greater than 10:1
- **Output Z:** Available from 2000 ohms
- **I In:**  $\geq 50$  ma

Operating frequencies up to 5 mc can be attained in lines of 10 to 60 microseconds in length.

————— MIL —————

**Vibration:** 55 to 500 cps at 15g.  
5 to 55 cps at .06" excursion

**Shock:** 80g for 11 milliseconds

**Finish:** Baked Gray Enamel. MIL-E-15090. Other finishes available

**Durability:** 90 HR Salt Spray

**Hermetically Sealed**

SCRIBBLE HERE



### **Custom Manufactured Delay Lines**

We are prepared to engineer and manufacture delay lines to meet exacting specific requirements.

Write giving your specifications for firm quotations.

## **APPLICATIONS**

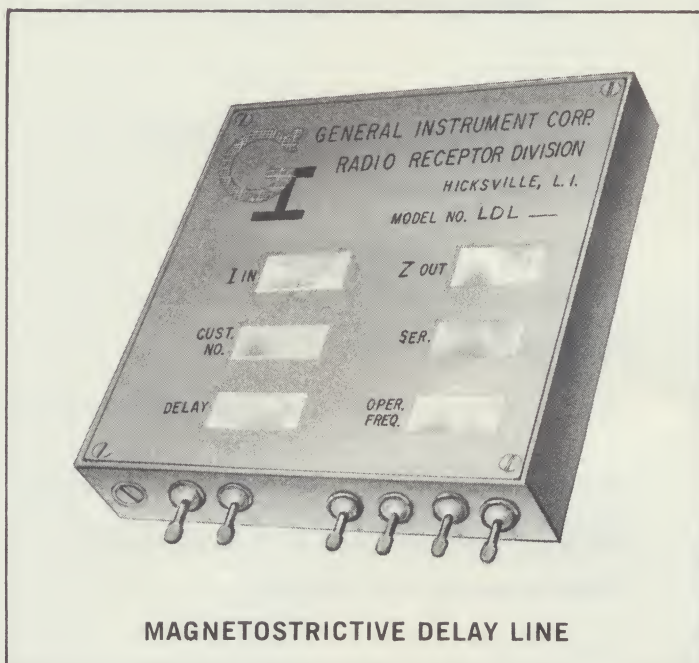
- **Radar Simulators**
- **Telemetry Systems**
- **Missiles and Aircraft**
- **Computers**
- **Navigational Systems**



**GENERAL INSTRUMENT CORPORATION**  
DEFENSE AND ENGINEERING PRODUCTS GROUP



## ULTRASONIC DELAY LINES



MAGNETOSTRICTIVE DELAY LINE

### GENERAL INSTRUMENT MAGLINE

### LDL Series Longitudinal Mode

DELAY RANGE:  
10 to 1000  $\mu$ sec

#### FEATURES

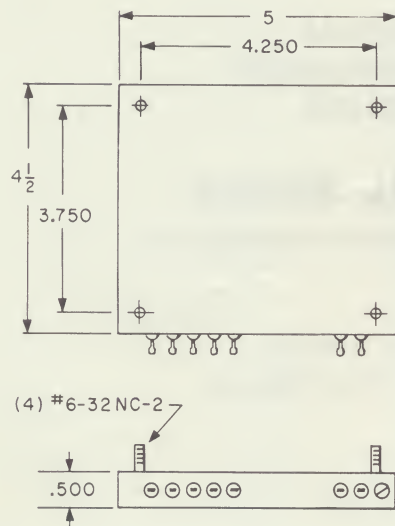
- Small—Light Weight
- Wide Delay Ranges
- Excellent Shock and Vibration Characteristics
- Dust Proof—Sealed
- Low Temp. Coefficient of Delay
- High Ratio of Delay to Pulse Rise Time
- Adjustable
- High Signal to Noise Ratios
- To Mil or Commercial Specifications

#### APPLICATIONS

- Computers
- Coders and Decoders
- Telemetry Systems
- Navigational Systems
- Radar Simulators
- Missiles and Aircraft

## LDL Series

### TYPICAL PACKAGE



### Custom Manufactured Delay Lines

We are prepared to engineer and manufacture delay lines to meet exacting specific requirements.

Write giving your specifications for firm quotations.

### SPECIFICATIONS (General)

**Delay Range:** Nominal 10 to 1000 microseconds

**Adjustment:** To 8 microseconds

**Taps:** Available to suit specifications

**Tolerance On Nominal Delay:**  $\pm 50$  nanoseconds

**Temperature Range:**  $-25^{\circ}$  to  $+100^{\circ}\text{C}$

**Temperature Coefficient of Delay:** Less than 2 parts/million/ $^{\circ}\text{C}$ .  
Lower values on request.

**Insertion Loss:** 40 to 60 db—with Read-Write Amplifiers 1:1

**Signal to Noise Ratio:** Greater than 10:1 without taps

**Output Z:** Available from 2000 ohms

**I In:**  $\geq 50$  ma

**Carrier Frequency:** 100 kc to 1 mc

**Ratio of Delay to Pulse Rise Time:** 800:1

MIL

**Vibration:** 55 to 500 cps at 15g.  
5 to 55 cps at .06" excursion

**Shock:** 50g for 11 milliseconds

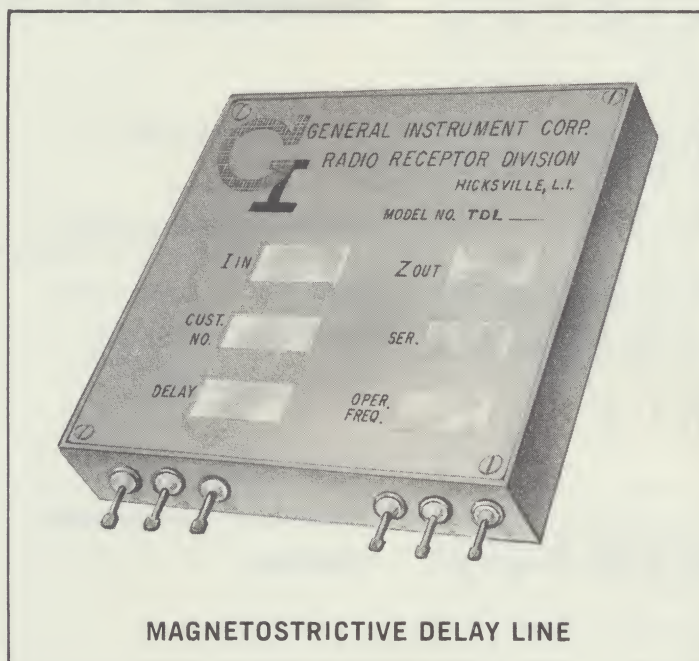
**Finish:** Baked Gray Enamel. MIL-E-15090. Other finishes available

**Durability:** 90 HR Salt Spray

**Hermetically Sealed**



## ULTRASONIC DELAY LINES



### GENERAL INSTRUMENT MAGLINE

### TDL Series Torsional Mode

DELAY RANGE:  
1 to 15 Milliseconds

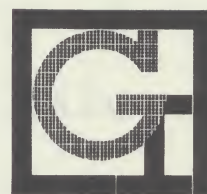
#### FEATURES

- Small—Light Weight
- Wide Delay Ranges
- Excellent Shock and Vibration Characteristics
- Dust Proof—Sealed
- Low Temp. Coefficient of Delay
- High Ratio of Delay to Pulse Rise Time
- Adjustable
- High Signal to Noise Ratios
- To Mil or Commercial Specifications

#### APPLICATIONS

- Computers
- Coders and Decoders
- Telemetry Systems
- Navigational Systems
- Radar Simulators
- Missiles and Aircraft

MODEL	TDL-10	TDL-15	TDL-20	TDL-25	TDL-30	TDL-35	TDL-46	TDL-50	TDL-70	TDL-100	TDL-150
DELAY	1 MS	1.5 MS	2 MS	2.5 MS	3 MS	3.5 MS	4.6 MS	5 MS	7 MS	10 MS	15 MS
ADJUST RANGE	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 2\mu s$	$\pm 3\mu s$
CASE SIZE	$3\frac{1}{2} \times 4 \times \frac{1}{2}$	$4\frac{1}{4} \times 4\frac{7}{8} \times \frac{1}{2}$	$4\frac{1}{4} \times 4\frac{7}{8} \times \frac{3}{4}$	$4\frac{1}{2} \times 4\frac{7}{8} \times \frac{7}{8}$	$5\frac{1}{4} \times 5\frac{1}{4} \times \frac{3}{4}$	$6 \times 6 \times \frac{1}{2}$	$6 \times 7 \times \frac{3}{4}$	$6 \times 7 \times \frac{3}{4}$	$9 \times 9 \times \frac{3}{4}$	$10 \times 10 \times \frac{3}{4}$	$10 \times 10 \times 1$
BIT STORAGE (RZ TYPE)	1000	1500	2000	2500	3000	3500	4600	5000	7000	10,000	11,250
REP. FREQUENCY	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC	0-1 MC
E IN	20V.	20V.	20V.	20V.	25V.	25V.	25V.	28V.	28V.	28V.	28V.
I IN	55 MA	55 MA	55 MA	55 MA	65 MA	65 MA	65 MA	65 MA	80 MA	80 MA	80 MA
Z IN	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$	500 $\Omega$
INPUT PULSE WIDTH	.45 $\mu s$	.45 $\mu s$	.45 $\mu s$	.45 $\mu s$	.45 $\mu s$	.45 $\mu s$	.40 $\mu s$	.40 $\mu s$	.40 $\mu s$	.40 $\mu s$	.40 $\mu s$
" RISE TIME $\mu s$	.03	.03	.03	.03	.03	.025	.025	.025	.025	.025	.025
" FALL TIME $\mu s$	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05	.05
E OUT	20 MV.	20 MV.	15 MV.	15 MV.	15 MV.	15 MV.	15 MV.	15 MV.	10 MV.	5 MV.	3 MV.
Z OUT $\Omega$	1500	1500	1500	1500	2000	2000	3000	3000	3500	4000	4000
OUTPUT PULSE WIDTH $\mu s$	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0	1.0
SIG./NOISE (STATIC)	50:1	50:1	50:1	50:1	50:1	50:1	50:1	40:1	40:1	30:1	30:1
SIG./NOISE (DYNAMIC)	25:1	25:1	25:1	25:1	25:1	25:1	25:1	20:1	20:1	15:1	15:1



**TDL Series**

#### MIL SPEC.

#### Hermetically Sealed

Vibration: 55 to 500 cps at 15g  
5 to 55 cps at .06" excursion

Shock: 50g for 11 milliseconds

Durability: 90 HR Salt Spray

Finish: MIL-E-15090

#### Other Electrical and Mechanical Configurations Available.

#### Custom Manufactured Delay Lines

We are prepared to engineer and manufacture delay lines to meet exacting specific requirements.



## MINIATURE SONIC DELAY LINES

- HIGH DENSITY PACKAGING
- CASE SIZE LESS THAN 3.75 CU. INCHES
- ENCAPSULATED
- MIL SPECIFICATIONS



MAGNETOSTRICTIVE DELAY LINE

- ELECTRONICS AVAILABLE IN SAME PACKAGE

### GENERAL INSTRUMENT MAGLINE

### MLDL Series Longitudinal Mode

DELAY RANGE:  
10 to 1000  $\mu$ sec

### APPLICATIONS

- Computers
- Coders and Decoders
- Telemetry Systems
- Navigational Systems
- Radar Simulators
- Missiles and Aircraft

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### FEATURES

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- |                        |                                  |   |  |
|------------------------|----------------------------------|---|--|
| • Small — Light Weight | • Dust Proof — Sealed            | • Excellent Shock and Vibration Characteristics | • High Ratio of Delay to Pulse Rise Time |
| • Wide Delay Ranges    | • Low Temp. Coefficient of Delay | • High Signal to Noise Ratios                   |  |

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## The G.I. Encapsulation Story

The encapsulation techniques developed at G.I. have made a major breakthrough in filling industry's needs for high shock, vibration and thermal requirements. The entire delay media package is encapsulated in silicone rubber in such a manner that no additional insertion losses are incurred over non encapsulated lines. The techniques and processes are proprietary to G.I. and are offered at no additional cost to you.

PAT. PEND.

SCRIBBLE HERE.



## ***MLDL Series***

### ***SPECIFICATIONS (General)***

**Delay Range:** Nominal to 10 to 1000 microseconds

**Tolerance On Nominal Delay:**  $\pm 50$  nanoseconds

**Temperature Range:**  $-55^{\circ}$  to  $+100^{\circ}\text{C}$

**Temperature Coefficient of Delay:** Less than 20 parts/million/ $^{\circ}\text{C}$ .  
Lower values on request.

**Insertion Loss:** 40 to 60 db—with Read-Write Amplifiers 1:1

**Signal to Noise Ratio:** Greater than 5:1 without taps

**Output Z:** Available from 2000 ohms

**I In:**  $\geq 50$  ma

**Carrier Frequency:** 100 kc to 1 mc

**Ratio of Delay to Pulse Rise Time:** 800:1

---

MIL

**Vibration:** 55 to 500 cps at 15g.  
5 to 55 cps at .06" excursion

**Shock:** 50g for 11 milliseconds

**Finish:** Baked Gray Enamel. MIL-E-15090. Other finishes available

**Durability:** 90 HR Salt Spray

**Hermetically Sealed**

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#### **Custom Manufactured Delay Lines**

We are prepared to engineer and manufacture delay lines to meet exacting specific requirements.

Write giving your specifications for firm quotations.

---

**Case Size:**  $2\frac{3}{16} \times 3\frac{7}{8} \times \frac{7}{16}$ "



## ULTRASONIC DELAY LINES

### GENERAL INSTRUMENT MAGLINE

### SLDL Series Longitudinal Mode

DELAY RANGE:  
150 to 500  $\mu$ sec

### FEATURES

- Attenuation 30 db Max.
- Encapsulated
- Requires No Input Power
- Push Pull Techniques
- Dynamic Signal to Noise Ratio 20:1 Min.
- Small — Light Weight
- Dust Proof — Sealed
- To Mil or Commercial Specifications
- High Ratio of Delay to Pulse Rise Time

### TYPICAL PACKAGE

#### INPUT:

$E_{IN}$  — 25 V.  
 $I_{IN}$  — 100 ma  
 $P_W$  — .8  $\mu$ /sec.  
 $P_{RF}$  — 40 kc min.  
 $T_R$  — 50 nano/sec.

#### OUTPUT:

$E_{OUT}$  — 3.2 Volts  
 $P_W$  — .8  $\mu$ /sec. @ 50% Amp.  
 $T_R$  — 250 nano/sec.  
 $T_O$  — 78  $\mu$ /sec.

#### SIZE:

5 x 4 x .75"



MAGNETOSTRICTIVE DELAY LINE

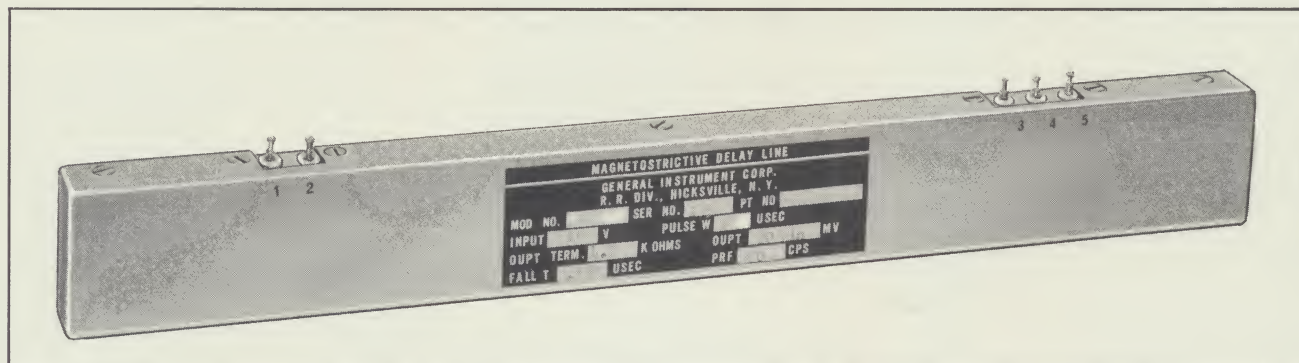
### APPLICATIONS

- Radar Simulators • Telemetry Systems • Missiles and Aircraft • Coders and Decoders • Navigational Systems

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ADVANCED DEVELOPMENT LABORATORY, EAST AND WEST COAST DIVISIONS / AUTOMATIC MANUFACTURING DIVISION / THERMOELECTRIC DIVISION / MAGNEHEAD  
DIVISION / SYSTEMATICS DIVISION / G.I.—F. W. SICKLES OF CANADA, LTD. / APPLIED RESEARCH LABORATORY / SEMICONDUCTOR DIVISION / CAPACITOR DIVISION



## ULTRASONIC DELAY LINES



### ***XLDL Series***

#### ***Longitudinal Mode***

**DELAY RANGE:**  
to 50 microseconds

- Delay Adjustment:  
Continuously variable from 0.8 microseconds  
to maximum delay
- Electronics available  
in same package
- To Mil or Commercial  
Specifications
- Other Electrical and  
Mechanical Configurations  
available
- Operating frequencies  
to 4.0 mc in the  
NRZ mode

*800 NANO SECONDS!!*

Lower values on request.

### ***APPLICATIONS***

- Computers
- Coders and Decoders
- Telemetry Systems
- Navigational Systems
- Radar Simulators
- Missiles and Aircraft

### ***FEATURES***

- Small—Light Weight
- Wide Delay Ranges
- Dust Proof—Sealed
- Low Temp. Coefficient of  
Delay
- Excellent Shock and  
Vibration Characteristics
- High Signal to Noise Ratios
- High Ratio of Delay to  
Pulse Rise Time

DATA SHEET DL405-64



## **MICRO-MINIATURE DELAY LINES**

COMPLETE WITH READ-WRITE  
MICROELECTRONICS IN LESS  
THAN 3.75 CU. INCHES



MAGNETOSTRICTIVE DELAY LINE

**GENERAL  
INSTRUMENT  
MAGLINE**

**MMLDL Series**  
*Longitudinal Mode*

### **FEATURES**

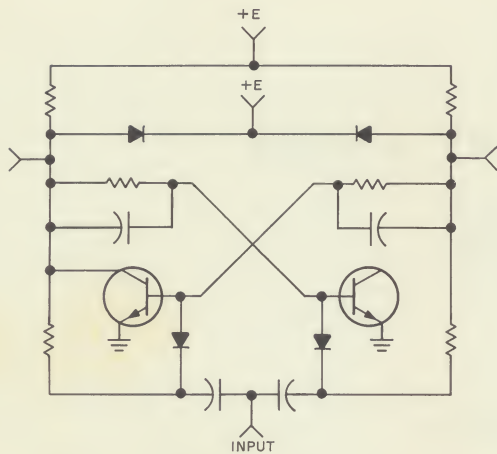
- Small—Light Weight
- Wide Delay Ranges
- Dust Proof—Sealed
- Low Temp. Coefficient of Delay
- Excellent Shock and Vibration Characteristics
- High Signal to Noise Ratios
- High Ratio of Delay to Pulse Rise Time
- Delay Range:  
10 to 500  $\mu$ sec
- High Density Packaging
- Encapsulated
- MIL Specifications

### **APPLICATIONS**

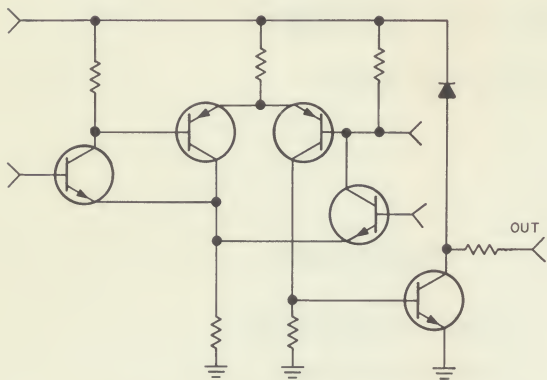
- Computers
- Coders and Decoders
- Telemetry Systems
- Navigational Systems
- Radar Simulators
- Missiles and Aircraft

DATA SHEET DL406-65

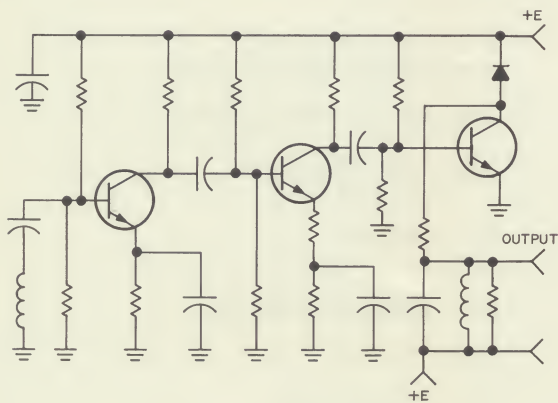
## LOGIC CIRCUIT ELEMENTS



FLIP FLOP



DRIVER AMPLIFIER (WRITE)



READ AMPLIFIER

## MMLDL Series

### SPECIFICATIONS (General)

**Delay Range:** Nominal 10 to 500 microseconds

**Tolerance On Nominal Delay:**  $\pm 50$  nanoseconds

**Temperature Range:**  $0^{\circ}$  to  $+65^{\circ}\text{C}$

**Temperature Coefficient of Delay:** Less than 20 parts/million/ $^{\circ}\text{C}$ .  
Lower values on request.

**Insertion Loss:** 40 to 60 db—with Read-Write Amplifiers 1:1

**Signal to Noise Ratio:** 4:1 min.

**Output Z:** Available from 1K to 3K

**Logic Drive:** As little as 3 volts

**Carrier Frequency:** 0-750 KC (Higher on special order)

**D.C.:** + 6 volts

MIL

**Vibration:** 55 to 500 cps at 20g.  
5 to 55 cps at .06" excursion

**Shock:** 100g for 11 milliseconds

**Finish:** Blue Anodize. Other finishes available

**Durability:** 90 HR Salt Spray

**Entirely Encapsulated**

#### Custom Manufactured Delay Lines

We are prepared to engineer and manufacture delay lines to meet exacting specific requirements.

Write giving your specifications for firm quotations.



**GENERAL INSTRUMENT CORPORATION**  
DEFENSE AND ENGINEERING PRODUCTS GROUP

# GENERAL INSTRUMENT CORPORATION



DEFENSE AND ENGINEERING PRODUCTS GROUP